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ENVIRONMENTAL ISSUES IN JAPAN: THE DOMESTIC DIMENSION

Summary

To many observers Japan has an environmental image reminiscent of Dr. Jekyll and Mr. Hyde. Accomplishments in the fields of energy efficiency and antipollution technology vie with less favorable reports of international ecological behavior. Neither image fits perfectly. A look at Japan's internal approach to selected environmental issues -- global warming, waste management and land use -- shows a mixed response by the government, the business sector and the public and helps indicate how Japan's environmental policies are shaped through internal concerns, international attention or -- in some instances -- both.

Introduction

Japan's environmental mien varies in its public and private reflections. To the outside world indifference at times has appeared to color its approach, although this is changing in a great many situations. While ecological concerns are not yet pervasive enough to have generated a master plan for the environment in Japan, episodes involving air and water pollution plus cultural attitudes that encourage a husbanding of resources have helped shape several strict environmental laws. As the world becomes increasingly aware of the shrinking global landscape, almost all countries are paying more attention to the effects of industrialization and the measured responses required to improve standards of living from both an economic and an environmental standpoint. Japan is no exception.

This report will concentrate primarily on domestic environmental policies, not to avoid the controversy of Japan's hand in such international hot

spots as deforestation and "strip-mining of the oceans" -- which will be addressed in a later report -- but to offer a broader understanding of selected environmental issues in Japan. In this respect the paper will focus on issues related to global warming, waste management and land use, issues that face every country challenged to accept the responsibility of handling its own industrialization without abusing citizens, neighbors or natural resources.

Global Warming-Related Issues

The current hot topic of global warming generates controversy over whether the expected warming of the earth's atmosphere by a blanket of various gases will be severe enough to pose harmful effects. Most environmentalists push for a quick international response to restrain the devastation of natural buffers like forests and the oceans as well as the growth of "greenhouse" gases, such as carbon dioxide, methane and chlorofluorocarbons. Cautious politicians and industrialists, however, urge more study to determine whether the expected high cost of combating the greenhouse effect is worth the outlay.

Chlorofluorocarbons - Japan generally has joined the majority of other industrialized nations in expressing concern over the greenhouse effect. Most of its concrete actions, however, have dealt with reductions of CFCs, the gas accused of depleting the protective ozone shield in the earth's upper atmosphere. In September 1988 Tokyo signed the Montreal Protocol to freeze CFC production and use at 1986 levels. Since then Japan has supported a CFC ban by the year 2000 provided that substitutes will be available. In meetings with government officials Japanese CFC producers and users learned that as of July 1, 1989 they would face quotas requiring a 30 percent cut to achieve 1986 levels, which were put at 132,200 tons for producers and 9,740 tons for importers (see JEI Report No. 33B, August 25, 1989). The Ministry of International Trade and Industry also offered financial assistance to help develop CFC substitutes and recycling technology.

At least one report has suggested that Japan's willingness to agree to CFC reductions mirrors its recognition that those first to the market with CFC alternatives will have an advantage in the production of less ozone-destructive air conditioners, solvents for cleaning electronics and various types of foam and aerosols. While acknowledging that E.I. duPont de Nemours & Co. has the jump on Japanese firms looking for CFC substitutes, the Economist points out that Japan's top five CFC producers are "pulling out the stops to catch up."[1]

Carbon dioxide - In the more complex arena of CO_2 emissions (see Table 1), Tokyo has taken a more measured approach. The trade-offs being considered to regulate this by-product of industrial activities spur more debate than does the question of how to cope with CFCs. Scientists disagree over whether CO_2 emissions are deleterious and whether the oceans will be able to offset any global warming. Both Tokyo and Washington have urged more study of possible greenhouse effects. They succeeded in dissuading participants at a November

[1]"Friendly Gases," Economist, May 20, 1989, p. 74.

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meeting in the Netherlands from establishing a definitive timetable for reducing CO_2 levels pending a late 1990 report by the United Nations' Intergovernmental Panel on Climate Change. The majority of the 68 nations represented did agree, however, that the output of greenhouse gases should be stabilized as soon as possible (see JEI Report No. 44B, November 17, 1989).

Table 1: Top Four Countries' Emissions of Industrial Carbon Dioxide

(in millions of metric tons of carbon)

	1983		1985		1987	
Country	Amount	Percent of World Total	Amount	Percent of World Total	Amount	Percent of World Total
Japan	239.8	4.7%	254.2	5.0%	251.0	4.4%
United States	1,149.5	22.6	1,201.4	22.3	1,225.6	21.7
USSR	941.4	18.5	987.6	18.4	1040.2	18.4
China	455.2	9.0	538.0	10.0	595.2	10.5

Source: Carbon Dioxide Information Analysis Center (Oakridge, Tennessee: 1989).

On the home front Tokyo is juggling several issues related to global warming. Two are interrelated: fears about waning energy efficiency and possible alternative energy schemes. Also of concern are more severe pollution from a greater number of cars and trucks in use and acid rain, previously thought to be a minor problem in Japan.

Energy efficiency - While many industrialized nations are calling for cuts in CO_2 emissions, not everyone in Tokyo concurs. MITI in particular is cautious about how the reductions would be effected. MITI and others feel that Japan's past record on energy efficiency -- among the best in the industrialized world -- should be weighed so that Japan would not face the same restrictions as energy wastrels. However, since Japan's FY 1988 consumption patterns showed the increase in energy use surpassing the country's economic growth rate (see JEI Report No. 40A, October 20, 1989), many environmental analysts are worried that Japan's economic growth machine will require ever more energy, albeit used under efficiency constraints installed after the twin oil shocks of the 1970s. Also, MITI's 1987 long-range expectation of slightly more than 1 percent growth in energy consumption per year through 1995 was much too optimistic given the past two years' substantially higher usage patterns. Thus, MITI has set about revising its energy consumption forecasts.

Nevertheless, the call for energy efficiency continues to be among Tokyo's preferred measures for alleviating CO_2 emissions. An energy advisory committee to MITI's Agency of Natural Resources and Energy recommended in October a greater reliance on energy efficiency to combat global warming since, it said, all primary energy sources (oil, coal and nuclear) have social or environmental complications.

Possible efficiencies could be found, according to Osayuki Yokoyama of MITI's Agency of Industrial Science and Technology, through industry's utilization of technologies that combine fuel cells and air-conditioning systems, heat

pumps to recover otherwise wasted energy or cogeneration.[2] In the home the possibilities for efficiencies include improvements in insulation and electrical appliances. On the road the potential contributions could be made with more fuel-efficient engines and improved traffic and transportation systems.

Alternative energy ideas - Since much of the CO_2 produced is from the breakdown of fossil fuels, a look at fuel alternatives is appropriate. Dirty fuels, such as oil and coal, add more CO_2 to the atmosphere than cleaner fuels like natural gas. Solar and nuclear energy are among the cleanest, and, as such, their proponents have begun waving the global warming banner to attract supporters to their favored power source. The push for nuclear energy is the strongest but is meeting the greatest resistance from those who fear a reenactment of a Chernobyl-style accident.

• Nuclear power - Currently Japan relies on 37 nuclear power plants to generate about 25 percent of its total electricity needs. An ANRE advisory committee recommended in June that nuclear power be considered a serious contender as an alternate to CO_2-producing fossil fuels. But the committee and others have acknowledged that nuclear power meets with mistrust. And, concerned that public antipathy to nuclear power will work against an increase in nuclear capacity, the Science and Technology Agency recently issued a report on nuclear safety that addressed problems and regulations related to nuclear plants.

The paper, released in late October, recommended paying greater attention to the problems of aging reactors and human errors, two areas not likely to reassure a doubting public. Neither is the appearance of two nuclear accident rating schemes likely to instill confidence. Between them the Science and Technology Agency and MITI share jurisdiction over Japan's reactors. Both outlined their rating criteria this past summer, but MITI's system drew the most criticism, perhaps because STA operates more research-oriented facilities. Critics contend that MITI's index could downplay an accident's hazards. In making its criteria public the ministry said that Japan's 390 reactor accidents between 1981 and 1987 would have ranked between 0 and 2 on a scale that would have assigned Chernobyl an 8 and Three Mile Island a 5. Further public relations efforts include disclosure that workers at power plants averaged radiation exposures equivalent to two X-rays in FY 1988. Those most directly exposed averaged 0.18 rems, far below the standard of 5 rems. This report came out the same day MITI approved operations at a new Hokkaido nuclear plant.

• Solar power - Other alternative fuels seen through the greenhouse prism include solar power technologies. MITI, which created the Sunshine and the Moonlight projects for boosting alternative power sources, has committed funds this year to develop solar cells that can be built into a house to improve its energy efficiency. However, manufacturers of solar cells see their greatest sales opportunities overseas, partially because Japanese tax authorities offer no subsidies or deductions for solar systems while the United States does. (The Japanese government, however, provides low-interest loans to buyers of solar water heaters.)

A December Kyodo article noted that the main constraints on small sun-powered generation systems continue to be high manufacturing costs, regulations

[2]Osayuki Yokoyama, "Cooling the Greenhouse," Journal of Japanese Trade and Industry, No. 5, 1989, p. 18.

and an energy industry reluctant to encourage homeowners to set up supplemental power supplies.[3] MITI also has continued to fund projects that convert oil-powered plants to another fuel source (see JEI Report No. 40A, October 20, 1989). In many respects MITI appears to be hoping that scientists will develop technologies that will recover escaped CO_2 and reuse it, thus avoiding major energy conversions.

• Alternative automotive fuels - Perhaps the alternative fuel options closest to entering the market lie in the automotive industry, where both technology and altered traffic patterns are considered keys to reducing greenhouse gases. The number of cars and trucks on the road in Japan has soared in recent years, alarming not only environmentalists but also traffic authorities. In early December they declared a state of emergency after recording the deaths of 10,000 people in traffic accidents between January 1 and November 30 (see Tables 2 and 3).

Table 2: Number of Motor Vehicles in Use in Japan

(in thousands)

Year	Cars	Trucks	Buses	Other	Total	Change
1970	8,779	8,282	188	333	17,582	16.2%
1975	17,236	10,044	226	584	28,091	4.9
1980	23,660	13,178	230	789	37,856	4.5
1985	27,845	17,140	231	942	46,157	3.7
1986	28,654	18,109	233	977	47,972	3.9
1987	29,478	19,163	234	1,027	49,902	4.0
1988	30,776	20,350	238	1,086	52,450	5.1

Source: Ministry of Transportation

Table 3: Passenger Transportation Usage in Tokyo, Nagoya and Osaka

Mode	FY 1970	FY 1975	FY 1980	FY 1983
National Railway	19.5%	20.1%	17.8%	17.7%
Private Railway	24.9	24.0	23.5	23.6
Subway	9.1	10.7	11.1	11.8
Surface Tram	1.9	0.6	0.3	0.2
Bus	17.8	15.9	13.3	12.1
Limousine/Taxi	7.8	5.2	5.2	5.0
Private Car	18.9	23.5	28.8	29.7

Note: The number of passengers carried was placed at 24.7 billion in FY 1970, 26.9 billion in FY 1975, 29.2 billion in FY 1980 and 30.4 billion in FY 1983.

Source: Environment Agency, Quality of the Environment in Japan 1987.

[3]Dennis Pidge, "Solar to Electricity Still Not Cost-Effective in Japan," Kyodo News Service, December 12, 1989.

All those motor vehicles and drivers, however, may be urged in the future to trade in their gas-powered versions for one of a variety of more CO_2-friendly engines. Among the possibilities are electric cars, including solar-cell models, and engines powered either by methanol, natural gas or hydrogen. Other options include two-stroke, lean-burn and variable-displacement engines; the latter two already are powering cars. Analysts are musing whether Japanese automotive makers will be able to repeat their successes of the oil-scarce 1970s with updated versions of fuel-efficient models. And others, for example Ford Motor Co., wonder whether the move to greater fuel efficiency is worth the cost. A November 20 Newsweek article reported that Ford questioned whether a doubling of fuel efficiency, which would halve the amount of CO_2 contributed by cars to the atmosphere (from 1.2 percent of the total to 0.6 percent), is worth the effort.

Of course, fuel efficiency depends not just on the types of fuel used but on the weight of a vehicle, its aerodynamics and its engine operation, among other variables. The Japanese are exploring all these areas. The Environment Agency has set up a panel to look into methanol-powered engines, while MITI's Japan Automobile Research Center is testing 12 varieties of such vehicles developed in conjunction with eight of Japan's automakers.[4] Running in the same popularity league as methanol is the electric car. Several versions have surfaced in Japan and not only at car shows. MITI has recorded the use of 700 on-road vehicles and 1,380 off-road cars powered by electricity, usually for deliveries or resort use. The major push here is for sustained service with highway-capable speeds.

While not as popular a draw for research in Japan, natural gas-powered engines currently are in use in many areas (including British Columbia). Osaka Gas Co., Ltd. began test runs in September on a Mitsubishi Motors Corp. car that had been outfitted with a natural gas combustion chamber. Initial reports indicate the engine generates 30 percent less CO_2 than regular engines. Perhaps the also-ran in current research is the hydrogen-powered car, which continues to be tested to improve its performance.

As for two-stroke engines, Japanese motor vehicle manufacturers will be competing with Australian Orbital Engine Co. and U.S. firms to achieve the right blend of fuel efficiency and power. The other two innovations, lean-burn and variable-displacement, already are installed in some Japanese cars and achieving up to 20 percent greater fuel efficiencies. Aerodynamic engineering continues to challenge all producers, with recent Japanese luxury models relying partly on styling to help keep within the limits set for American fuel efficiency.

What implementation of some of these developments can mean for global warming is less CO_2 -- except for the fact that more cars and trucks are on the roads. Similarly, customers and manufacturers alike are having fun with more powerful, less fuel-efficient models that are taking advantage of low gasoline costs in most countries. Alan Miller, director of the Center for Global Change, wrote in September that Japan's growth in personal income and the declining real price of oil have helped boost that country's demand for larger cars. "The government has not attempted to combat this trend with higher gasoline taxes and in 1988 removed a tax penalty on larger cars as part of recent tax

4"Interest in Alternate Fuel Revs Up," Focus Japan, October 1989, p. 5.

'reform' legislation," Miller wrote.[5] Nevertheless, the average cost of gasoline in Japan still surpasses the equivalent figure for the United States.

One response to the greater amount of traffic comes from the Transportation Ministry, which is seeking funds in the FY 1990 budget for a two-year research project to determine the extent of CO_2 emissions from air, land and sea vehicles. A by-product of the research is expected to be a renewed emphasis on public transportation as well as development of traffic patterns designed to speed buses along crowded highways. The Environment Agency's 1989 white paper urged improved traffic control as well as economic incentives for low-pollution vehicles as part of its promotion of an "Ecopolis," a city where people live in harmony with the environment (the theme of last year's white paper on the environment).

Nitrogen oxides - Another automotive-related concern associated with global warming is pollution from nitrogen oxides, which contribute to smog and, thus, to greenhouse warming. Technology, such as the catalytic converter, has gone a long way in reducing NO_X emissions, but they remain a problem in Japan. Based on a yearly average of 22 car exhaust monitoring stations, emissions of nitrogen dioxide rose in FY 1987 to 0.041 parts per million, the highest level in four years. All the recent readings at these stations have been above the estimated annual standard of between 0.02 and 0.03 ppm. The high of 0.042 ppm was recorded in FY 1978, the year the government enacted a requirement to reduce NO_X emissions from cars by 92 percent. (At more generalized environmental and air pollution monitoring stations the emissions fall within the standards, averaging 0.025 between FY 1982 and FY 1986 at 15 sites but increasing in FY 1987 to 0.028, still within the limits.)

NO_X emission standards are strict. A publication by the Ministry of Foreign Affairs notes that Japan's 1977 NO_X emission standards, which required cutting the earlier level by one-tenth, were so stringent that both foreign and domestic carmakers received a grace period for compliance.[6] In a comparison with other industrialized countries, however, Japan ranked lowest in NO_X emissions with 1.6 million tons, 2.3 percent of world totals in 1983; the top-listed polluter, the United States, emitted 21.3 million tons, 31 percent of the world total. Italy ranked second lowest with 1.7 million tons.

The problem is that NO_X and NO_2 emissions have not decreased much since the 1970s, despite the strict laws. Cities are particularly upset that NO_X density in certain areas has exceeded standards for two years. At a June meeting in Tokyo six local governments sought tighter auto emission standards for NO_X. New limits continue to be put into effect for emissions from various weights of trucks and buses on a schedule that began in December 1988 with diesel and gasoline-powered vehicles of under 1.7 tons and will continue through April 1, 1992 to include midget imports. In its 1989 white paper the Environment Agency urged curbs on vehicular traffic, particularly in urban areas, to counter the high NO_X levels. Increased truck use to move goods was one of the causes of continued high NO_X levels, the white paper said. Whether

[5]Alan Miller, "Perspectives on Global Warming in Japan" (unpublished paper, September 1989), p. 9.

[6]Ministry of Foreign Affairs, Japan's Approach to Environmental Issues of the Globe (Tokyo: September 1989).

the attention paid to various types of clean-energy fuel will affect, or possibly worsen (in the case of natural gas), NO_x emissions remains to be seen.

As in the case of NO_x emissions, the interplay between pollutants and global warming is complex. Nitrogen and methane may even neutralize the harmful effects of ozone-depleting gases in the upper atmosphere. But the interaction of NO_x with other gases in the breathable air can add to harmful smog, and, as NO_2, the pollutant contributes to acid rain.

Sulfur dioxide - Another factor in acid rain is sulfur dioxide. Japan's emission standards for both NO_2 and SO_2 are among the lowest, if not the lowest, in the world (see Table 4). Perhaps because industrial emissions are more easily controlled than emissions from an increasing number of vehicles (the main cause of NO_x output), Japan's SO_2 levels have dropped from a high of 0.059 ppm in FY 1967 to the FY 1987 low of 0.010, as recorded at 15 general environmental and air pollution monitoring sites. A cross-country comparison shows Japan with a low 1.1 percent of world sulfur oxide emissions at 1.19 million tons; the United States contributed 21.4 percent, or 23.38 million tons of SO_x. Japan's SO_2 standard is about one-third that of the U.S. daily limit.

Table 4: Comparison of Sulfur Dioxide and Nitrogen Oxide Emissions

(in thousands of metric tons)

	Japan		United States	
Pollutant	1980	1983	1980	1985
Sulfur Dioxide	1,259	1,079	23,200	20,700
Standards (parts per million)*	0.04		0.14	
Nitrogen Oxides**	1,339	1,416	20,300	20,000
Standards (parts per million) for Nitrogen Dioxide (NO_2)***	0.02-0.03		0.05	

*Standards calculated on a per-day basis.
**Nitrogen dioxide is measured in the atmosphere. Nitrogen oxides refer to both nitric oxide (NO) and NO_2.
***Figures estimated by converting Japan's per-day numbers to per-year numbers equivalent to the U.S. calculations.

Sources: Ministry of Foreign Affairs, Japan's Approach to Environmental Issues of the Globe, and World Resources Institute/International Institute for Environment and Development, World Resources 1988-89.

Japan's experience with reducing SO_2 emissions illustrates how Tokyo administers some of its antipollution laws. At the central government level standards are set and officials use administrative guidance on a case-by-case basis to help areas stay within pollution limits. Encouraged in the use of smokestack gas desulfurization and denitration technologies, industries also may find their renovation or expansion plans subject to recommendations, for example on the types of fuel to be used. A 1977 report by the Organization for

Economic Cooperation and Development noted: "In the plant-by-plant agreements signed between local governments and plant managements, the sulfur content of fuels is often prescribed."[7] The report also said, "The Japanese approach to pollution abatement therefore relies basically on 'administrative guidance' -- in the spirit of a planned economy rather than in the spirit of a market economy." In support of its view that official guidance engenders more compliance than the threat of punishment, the report described how on-site monitoring devices could detect changes in emissions so quickly that officials could place phone calls to potential violators urging them to switch fuels or adjust their processes.[8]

However, policing powers exist both through the threat of a tax to be imposed under the Compensation Law Scheme (which is applied to SO_2 violators) as well as judgment under the polluter-pays principle, which allows victims of pollution to take alleged perpetrators to court to obtain recompense. The most famous uses of this compensation device are related to water pollution cases like Minamata, when mercury linked to the Chisso Corp. was blamed for illness and the deaths of 1,030 people by yearend 1987. The case is credited with being the alarm that woke Japan to the dangers of unaudited industrialization.

Acid rain - Despite its successes with SO_2 reduction, however, Japan faces a growing problem with acid rain. The Foreign Ministry's September 1989 pamphlet on environmental issues indicates a degree of initial unconcern about the problem: "Emissions of SO_x and NO_x in Japan, strictly regulated and implemented, are considerably less when compared with the emissions in Europe and North America. Nevertheless, in order to prevent possible damage in the future, Japan promotes the research and study of acid rain as well as air pollution monitoring." However, late this past summer the Environment Agency reported its findings from a four-year sampling of more than 150 areas. The study revealed that all monitoring points had pH values under 5.6; numbers under 5.6 indicate acidity. The lowest had a pH value of 4.4, which was recorded in the Musashino community near Tokyo.

Earlier reports suggest that many Japanese believe their own emission controls are effective but that much of the pollution drifts from factories in China and South Korea. For example, a Japan Times report from December 1988 attributed high sulfuric and nitric acid readings taken in Nagasaki prefecture to pollutants from the mainland since "the pollution detected was different from typical air pollution over Japan . . . (and) increased after a north wind blew from the continent."[9] In an obvious link between its technological prowess and antipollution advances, Tokyo is seeing how aid to other countries to combat pollution can help improve its own air quality.

Technology key - Japan's approach to the global warming issue -- in addition to its support for further research -- relies primarily on technological

[7]Organization for Economic Cooperation and Development, Environmental Policies in Japan (Paris: 1977), p. 35.

[8]Ibid., pp.22-23.

[9]"Gases released on Asian mainland found to worsen pollution in Japan," Japan Times, December 30, 1988, p. 2.

innovations. Nowhere was that clearer than in recommendations made to the U.N. Intergovernmental Panel on Climate Change. Although the Environment Agency initially had proposed that the report should contain an index limiting each country to a certain amount of carbon dioxide output, this initiative was not included in the recommendations submitted in September. Neither was another variation of the quota system, the International Emission Trade Market in which those capable of reducing CO_2 output beneath a designated quota could sell credits to polluters, which would have a monetary incentive to reduce their own pollution. However, the consensus reached for Japan's report to the IPCC centered on using alternative energy sources, developing technologies that limit CO_2 output and drafting strategies to cope with the effects of global warming.

Eager to be among the leaders in addressing problems of climate change, Japan's strongest assets may be the model it provides for energy-efficient economic development and the technological innovations that could be trend-setters in an era of high pollution concerns. Since pollution problems impact even this technologically advanced country, however, the model will continue to be only a model student and not a master professor.

Waste Management

Japan sailed into the 1980s with a reputation built on its heritage of wasting few resources because it had few of its own. In the past decade, however, affluence not only has increased the amount of packaging, paper and waste but bred an indifference to recycling since "new" costs only slightly more (or possibly even less) than "recycled." Compounding the problems of waste and recycling are global-warming issues, such as: if nuclear power plants substitute for fossil fuel-burning plants, then how will the spent fuel be stored? Japan's industrial strength also is generating industrial-strength garbage, which will sorely test its strong record of waste treatment.

When it comes to handling its own solid waste Japan has yet to engage the garbage transports made famous by New York state, Canada and Italy. Health and Welfare Ministry officials reportedly have said Japan exports "almost no" toxic wastes, but they expect that day to arrive soon since domestic disposal options are approaching full capacity. In that expectation ministry officials have said Japan is willing to work with the U.N. Environment Program on international regulations for waste transport, even though Tokyo has not yet signed the U.N.-sponsored Basel convention on hazardous waste exports. That document is somewhat controversial in that environmentalists contend it facilitates dumping in Third World countries while others say the convention is needed to regulate the types of wastes and assign responsibilities for ultimate disposal.

Although Japan generally receives international kudos for its solid waste management programs, not all analysts are convinced of the programs' safety measures. Incinerators handle the majority of nonrecycled materials, and landfills -- including islands of waste repositories -- are responsible for the rest. Much of the processed waste is recycled, with industries responsible for handling their own wastes.[10] One Health and Welfare Ministry report last

[10]Council of State Governments, Environmental Management in Japan: What Can the States Learn? (Lexington, Kentucky: n.d.).

year noted that about 41 percent of all industrial wastes were recycled; 29 percent became part of reclamation projects, and the remainder was incinerated. A Council of State Governments study mission to Japan, however, indicated both amazement and concern over some of the waste handling. The visitors were surprised to see the care taken at one factory to separate from the waste flow each heavy metal in "different process lines . . . a costly option not frequently used in the U.S." They also noted the attention to detail in "a sludge incinerator being used at a sewage treatment plant, in an effort to reduce the volume of landfill waste." But the mission was puzzled over a lack of evident concern about incinerator emissions, such as dioxin (a carcinogen). "The plants we visited," the report said, "did not monitor these chemicals from their stacks . . . we drew the conclusion that concern about these chemicals is low in Japan." That assessment was reinforced, they said, after a newspaper reported that a recent university study "had shown the level of dioxin ingestion in Japan was 63 picograms/person/day, against a U.S. standard of 50. The standard in Japan is 5,000 picograms/day. The sources of this chemical were not given."[11]

As indicated by the COSG report, definitions and reporting methods about waste output, including hazardous materials, may make comparisons imprecise. Table 5, which shows Japan's hazardous waste production to be less than 1 percent of the U.S. output, should be viewed in that context. Another hazardous waste listing, however, may be considered more concrete, given the international attention paid to nuclear power plants and spent fuel. Table 6 shows Japan's spent nuclear plant waste as being about 4,300 metric tons. Storage currently is all aboveground, but a long-range plan proposes storage at Japan's largest nuclear fuel recycling complex, located in northern Honshu. The project, however, recently underwent radical revision. One report suggested that the alterations, which address concerns about rain or underground water leaking into the storage areas, may delay operation of the facility for another two years. The first outline for the Rokkasho, Aomori prefecture complex met strong public

Table 5: Waste Generation in Japan and the United States, 1983

(totals in thousands of metric tons)

	Municipal Waste Output			Industrial Waste Generation			Hazardous/ Special Waste	
Country	Total	Per Capita (lbs.)	Per Area*	Total	Per GDP*	Per Area*	Total	Per Area*
Japan	45,328	752	110.8	243,264	545	594.5	847	2.1
United States**	196,334	1,637	19.4	676,139	553	66.9	275,750	27.3

*Per GDP: per unit of gross domestic product; per area: metric tons per square kilometer per year.
**Figures on U.S. industrial waste generation are for 1985.

Source: World Resources Institute/International Institute for Environment and Development, World Resources 1988-89.

[11] Ibid., p. 7.

opposition; the revised version is expected to create skepticism over previous assurances of safety. Once completed the facility is expected to enable storage over the next 300 years.

Table 6: Japan's Nuclear Power Production and Waste Generation, 1986

	Number of Reactors	Net Capacity (megawatts)	Spent Fuel Inventory (cumulative metric tons of heavy metals)
Operating	34	24,754	4,300
Planned or under Construction	30	28,871	---

Source: World Resources Institute/International Institute for Environment and Development, World Resources 1988-89.

Public concern over incinerators and nuclear storage is as prevalent in Japan as elsewhere. The COSG report noted, however, that despite opposition incinerators often are built adjacent to residential areas and even used to heat senior citizens' complexes. Opposition in Sapporo over one plant lessened when residents learned that the affiliated heat-generating facility would reduce their heating costs. Another recent controversy over an incinerator focused less on its presence and more on the local government's handling of its relocation. Consensus is especially important in Japan's decisionmaking processes and may be one key to Japan's successful waste-handling programs.

Whether that success will continue in Japan's affluent society is unclear. The strength of the yen helps make raw materials cheaper in some cases than recycled material. And citizens who feel wealthy are less inclined to spend the time cleaning cans and bottles for recycling, reports have suggested.

Officials worried about Japan's increasing waste volume and affluent ways are calling for more recycling and care for disposal. The prime target is used paper, which has multiplied under the influence of fax machines, computers and copiers (see Table 7). As a result, the government has set up a Paper Recycling Promotion Center headquartered in Tokyo, where the local government already requires household separation of wastes. The aim of the new group, according to MITI, is to encourage major firms to recycle office waste paper. Another recycling cheerleader is the Clean Japan Center, which offers prizes for innovation in waste management as well as information. The MITI affiliate also is proposing large-scale waste processing centers that would double as heat generators. Yet another agency lending new attention to waste management is the Health and Welfare Ministry, which in November released a draft of guidelines for disposal of wastes related to hepatitis and human immunodeficiency hazards. The ministry estimates that medical wastes make up roughly 132,000 tons of the estimated 847,000 tons generated each year in Japan.

Recycling and waste management coincide naturally with Japan's oft-repeated concern about being a small nation with few natural resources. In an

Table 7: Comparison of Municipal Waste in Japan and the United States

Country	Year	Total (in 1000 metric tons)	Per Capita (in kg)	Percent Distribution			
				Paper Products	Plastics	Glass	Other
Japan							
	1980	41,511	355	27.4%	12.3%	8.0%*	52.3%
	1985	41,530	344	38.3	7.7	1.3	52.7
United States							
	1980	160,000	703	29.7	5.3	10.3	54.7
	1983**	178,000	744	34.7	6.7	9.0	49.6

*Includes ceramics.
**U.S. figures for total municipal waste were estimated by OECD for 1983. The percentages for paper products, plastics, glass and other waste are 1984 figures instead of 1983 data.

Source: Organization for Economic Cooperation and Development, Environmental Data Compendium 1989.

odd twist these issues fit into the third category to be briefly discussed here: land use.

Land Use

American trade negotiators see the term "land use" in Japan and immediately begin suggesting ways that urban farmland can be turned into housing complexes. But land use to the environmentally concerned could mean increased parkland for an improved aesthetic (see JEI Report No. 30A, August 4, 1989 for a look at housing and land use). Other land use options could entail expansion of land mass for waste disposal or even subterranean excavation.

In ecological terms the Tokyo area would not necessarily benefit if its 82,000 acres of farmland became residential fodder. Urbanization is putting greater strain on facilities that treat water, sewage and waste. If more people could buy housing sites closer to their jobs they possibly could take more public transportation and ease the strain on road use, but given greater housing availability the population density might be more likely to increase instead. While Tokyo continues to be bombarded with alternative uses for urban farmland and to struggle with the consequences of high land prices, those concerned with global warming see nothing wrong with more parkland and green space, which, if planted with CO_2-consuming shrubs and trees, would be more beneficial to the atmosphere than methane-producing rice paddies. The 1989 white paper on the environment suggested conservation of existing natural habitats in urban areas and creation of others, such as wildlife sanctuaries, gardening plots and "green trusts."

With limited space for expansion Japan has turned to the sea and begun building islands out of waste, thus solving two problems and perhaps creating new ones. Noncombustible waste, for example, goes from Tokyo collection centers

to a reclaimed island in Tokyo Bay. In the Osaka Bay Phoenix Plan about 150 local governments in six Kansai-area prefectures are cooperating to create islands off Amagasaki Port and Izumiotsu Port. Most of the deposits will be incinerated first, and only waste under specified toxicity limits will be permitted. Nevertheless, some nearby residents question the extent of protection offered by the barriers built to contain the waste. Although not addressed in this report, water pollution poses possibly one of Japan's biggest ongoing environmental problems.

Another innovative project with potential ecological disruption is the Neo-Urban Industrial Geo-dome, a seven-year MITI-sponsored proposal to study use of underground space for energy facilities, for example. Among other proposals for use of land deep within the earth are subways, highways, reservoirs and sewage disposal plants. Although engineers say they can offset the hazards from earthquakes, an environmental impact assessment would seem to be reasonable. The question of who would be responsible for such an assessment, however, exposes Japan's fragmented environmental policymaking process.

Public and Industry Attitudes

As can be discerned from the topics addressed in this report, several agencies deal with environmental matters and not all approach them from the same perspective. MITI tends toward industry's viewpoint, while the less powerful Environment Agency places ecological concerns uppermost. The Ministry of Agriculture, Forestry and Fisheries addresses some environmental issues, while the Ministry of Foreign Affairs helps coordinate the response to international problems. Mr. Miller of the Center for Global Change suggests that Japan's ability to respond to environmental issues is impeded by this divergence of responsibilities as well as by the "absence of an organized constituency backing the recommendations made in the reports."[12] Another impediment to a "green" movement in Japan, according to some sources, is the past perception of the ecologist in Japan as a rabble-rouser, an image not sought by a people with the adage that the nail that sticks out is the one hammered down.

Nevertheless, the worldwide attention being paid to the environment, particularly to global warming and its effect on industry, has impacted Japan, too. Environmental enthusiasm in Japan is a subject of some disagreement. A United Nations/Lou Harris poll showed far more Japanese rate their environment negatively than do Americans (see Table 8). Yet more are unwilling to pay higher taxes to prevent pollution (38 percent versus 18 percent of the Americans surveyed). However, in a Yomiuri Shimbun/Gallup Poll Japanese respondents outnumbered Americans in supporting environmental protection over economic development. Yet another survey suggested that Japanese consumers will buy environmentally hazardous products because they feel they have no choice or because they do not care about the potential impact. Only 14 percent of those surveyed said they avoided buying ecologically questionable goods -- such as those containing CFCs. The early 1989 survey by the Prime Minister's Office showed that the top environmental concern among those surveyed was industrial pollution (44 percent), followed by household noise and water pollution (38 percent), toxic waste pollution (31 percent) and nuclear power safety (30 percent). Such global worries as depletion of the ozone layer drew a top rating from only 21 percent.

[12]Alan Miller, "Three Reports on Japan and the Global Environment," Environment, XXXI, No. 6, July-August 1989, p. 28.

Table 8: Public Attitudes Toward Environment

Questions	Japan	United States	West Germany
*Economic development must have priority	4%	7%	1%
*Economic development should have priority	18	39	31
*Environmental protection must receive priority	13	12	20
*Environmental protection should receive priority	58	39	41
**Rating of country's environment			
Positive	16	35	15
Negative	83	64	83
**Should this country do more or less to protect environment/ curb pollution?			
More	91	97	83
Less	1	1	3
About the same	7	1	11
Not sure	1	--	3
**Degree of willingness to pay higher taxes for pollution prevention and similar measures			
Very willing	9	29	20
Somewhat willing	53	52	42
Not very willing	31	8	19
Not at all willing	7	10	12
Not sure	--	1	7

*Yomiuri Shimbun/Gallup Poll 1989
**UN Environment Program/Lou Harris Poll 1989

To deal with the individual consumer's concerns about the environment the Japan Environment Association introduced in February 1989 an Ecomark system similar to one being used in West Germany. Manufacturers (both domestic and foreign) that want their products to bear an Ecomark apply to the Japan Environment Association and must be able to attest that use of their product involves minimal or no pollution and/or could improve the environment. Also important is that disposal will cause minimal if any problems and that energy or resources be conserved through the product's use. Payment of a fee that ranges from Y80,000 to Y200,000 ($571 to $1,429 at Y140=$1.00) and signing of a two-year licensing contract rounds out the process. By August last year approximately 151 products had been approved. In a report about the project the external arm of the Environment Agency indicated that it hoped manufacturers and distributors would respond to consumer demand for certified products.

More organized than consumers is industry's response to concerns about global warming and other environmental issues. Keidanren (Japan Federation of Economic Organizations) issued a report in October emphasizing that the high cost of addressing CO_2 proliferation should be weighed against the potential damage to economic growth. The report urged technological advances to offset possible climatic change and sharing Japan's technological expertise with developing countries. Both the Japan Automobile Manufacturers Association and the Japan Chemical Industry Association are researching environmental impacts on their respective industries in efforts to minimize any attempt by Tokyo to impose strict antipollution or related regulations. However, these industries are perhaps in the vanguard of those able to capitalize on the market opportunities of advanced technologies.

Conclusion

Although not inspired by a grass-roots "green" movement such as that in Europe, Japanese policymakers find their ecological motivation from both a realization of potential environmental hazards within Japan and international pressures. Neither are they ignorant of the opportunities for world leadership and industrial advances to be made by adopting environmentally sensitive policies that advance economic well-being. Both the 1988 and the 1989 white papers on the environment addressed Japan's international role. While Tokyo can herald the Japanese model for some environmental issues like energy efficiency and emissions of nitrogen and sulfur oxides, other issues remain unexplored. The increased attention being paid to the overall environment is likely to make officials more aware of domestic pollution problems as well as the relationship between global and internal problems and the market opportunities presented to technological innovators.

For further information, contact Pat Murdo.

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The view expressed in this report are those of the author and do not necessarily represent those of the Japan Economic Institute.

APPENDIX

Government and Private Outlays on Environmental Protection Measures in Japan

(in billions of dollars and millions of yen)

Fiscal Year	Government Total dollars	Government Total yen	Government Change dollars	Government Change yen	Private Sector* Antipollution Investments	Private Sector* Change	Private Sector* Percent of Total Outlays
1987	$7.52	Y1,087,867	15.8%	-1.0%	$1.60	--	3.6%
1988	10.02	1,284,769	33.2	18.1	2.11	25.7%	3.5
1989**	9.24	--	-7.7	--	1.92	-8.7	3.5

Note: Due to exchange rate changes, the dollar-based figures show a decrease in FY 1989, although the yen-denominated amounts increased. For government expenditures that rise was 3.5 percent; for the private sector the boost was 2.4 percent.

*Not figured in yen. Overall industry expenditures for pollution control averaged Y893.4 billion for the combined years of 1985 through 1987.
**Proposed outlays.

Source: Ministry of Foreign Affairs and Ministry of International Trade and Industry

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